

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings of claims in the application:

LISTING OF CLAIMS:

1-64. (cancelled)

65. (new) A method of organic synthesis in a homogeneous phase on a soluble reaction support, without volatile organic solvents, comprising:

dissolving a soluble reaction support in the form of a functionalized salt in a liquid matrix in the form of an ionic liquid to provide organic synthesis on the soluble reaction support, without volatile organic solvents, wherein,

said ionic liquid is of formula  $A_1^+X_1^-$  and is in liquid or solid form at ambient temperature,

$A_1^+$  is selected from the group consisting of a functional cation, a non-functional cation, a mixture of non-functional cations, and a mixture of cations in which at least one of the cations is functional, and

$X_1^-$  is selected from the group consisting of a functional anion, a non-functional anion, a mixture of non-functional anions, and a mixture of anions in which at least one of the anions is functional.

66. (new) The method of claim 65, wherein,

$A_1^+$  is a non-functional cation or a mixture of non-functional cations,

and  $X_1^-$  a non-functional anion or a mixture of non-functional anions.

67. (new) The method of claim 65, wherein,

at least one of  $A_1^+$  and  $X_1^-$  is a functional ion,

functional cations and functional anions are cationic entities and anionic entities, respectively, linked to at least one function  $F_i$ ,

$F_i$  varies from  $F_0$  to  $F_n$ ,  $n$  being an integer varying from 1 to 10, with  $F_0$  being a function initially linked to said cationic entities and anionic entities and  $F_1$  to  $F_{10}$  being functions converted from said  $F_0$  after sequential and subsequent reactions with said cationic or anionic entities, and

said function  $F_i$  is selected from the group consisting of hydroxyl, carboxylic, amide, sulphone, primary amine, secondary amine, aldehyde, ketone, ethenyl, ethynyl, dienyl, ether, epoxide, primary phosphine, secondary phosphine, tertiary phosphine, azide, imine, ketene, cumulene, heterocumulene, thiol, thioether, sulphoxide, phosphorus-containing moieties, heterocycles, sulphonic acid, silane, stannane and functional aryl functions.

68. (new) The method of claim 65, wherein,

$A_1^+$  is a non-functional cation or a mixture of cations in which none of the cations is functional,

$X_1^-$  is a non-functional anion or a mixture of anions in which none of the anions is functional,

said soluble reaction support is at least one functionalized salt of formula  $A_2^+X_2^-$ ,

$A_2^+$  is selected from the group consisting of a functional cation, a non-functional cation, a mixture of cations in which none of the cations is functional, and a mixture of cations in which at least one of the cations is functional,

$X_2^-$  is selected from the group consisting of a functional anion, non-functional anion, a mixture of anions in which none of the anions is functional, and a mixture of anions in which at least one of the anions is functional, and

at least one of  $A_2^+$  and  $X_2^-$  is a functional ion,

said functional cation is of a formula  $Y^+-L-F_i$  and said functional anion is of a formula  $Y^--(L)_k-F_i$ ,

$Y^+$  and  $Y^-$  are ionic entities that carry the charge of the cation and the charge of the anion, respectively, linked via a linker L to at least one function  $F_i$ ,

L is an alkyl group of 1 to 20 carbon atoms,

$F_i$  varies from  $F_0$  to  $F_n$ , n being an integer varying

from 1 to 10, with  $F_0$  being a function initially linked to said cationic entities and anionic entities and  $F_1$  to  $F_{10}$  being functions converted from said  $F_0$  after sequential and subsequent reactions with said cationic or anionic entities,

said function  $F_i$  is selected from the group consisting of hydroxyl, carboxylic, amide, sulphone, primary amine, secondary amine, aldehyde, ketone, ethenyl, ethynyl, dienyl, ether, epoxide, primary phosphine, secondary phosphine, tertiary phosphine, azide, imine, ketene, cumulene, heterocumulene, thiol, thioether, sulphoxide, phosphorus-containing moieties, heterocycles, sulphonic acid, silane, stannane and functional aryl functions,

$k$  is equal to 0 or 1 so that when  $k$  is equal to 0,  $Y^-F_i$  is selected from the group consisting of  $OH^-$ ,  $F^-$ ,  $CN^-$ ,  $RO^-$  and  $RS^-$ , and

$R$  is an alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms.

69. (new) The method of claim 67, wherein,

a first part of said ionic liquid of formula  $A_1^+X_1^-$  provides the cationic entity  $Y^+$  or the anionic entity  $Y^-$  linked to one or more initial functions  $F_0$  as the liquid matrix,

a second part of said ionic liquid of formula  $A_1^+X_1^-$

provides the functionalized salt for the soluble reaction support so that the initial functions  $F_0$  are converted into first novel functions,

said liquid matrix and said functionalized salt forming a homogeneous phase, and

the first novel functions of the second part of said ionic liquid being capable of being converted subsequently into other functions without affecting the initial function  $F_0$  of the first part of said ionic liquid.

70. (new) The method of claim 68, wherein,

at least one of the  $A_2^+$  cation and the  $X_2^-$  anion of the at least one functionalized salt corresponding to a  $Y^-$  ionic entity linked to at least one function  $F_i$ , is immobilized in the liquid matrix and cannot be extracted from the liquid matrix by solvent extraction, and

the function or functions  $F_i$  of the at least one functionalized salt can be converted after at least one reaction resulting from the addition of at least one reagent to said composition.

71. (new) The method of claim 70, wherein more than one functionalized salt is immobilized.

72. (new) The method of claim 68, wherein  $A_2^+$  cation is functional.

73. (new) The method of claim 68, wherein the  $X_2^-$

anion is functional.

74. (new) The method of claim 68, wherein  $A_2^+$  and  $X_2^-$  are functional.

75. (new) The method of claim 68, wherein,  
said  $A_1^+X_1^-$  is an ionic liquid that is solid at ambient temperature and liquefiable with a temperature range from approximately 25°C to approximately 250°C, and

said functionalized salt  $A_2^+X_2^-$  is selected from the group consisting of: an ionic liquid that is solid at ambient temperature and that is soluble in a liquefied solid form of  $A_1^+X_1^-$ , and an ionic liquid that is a liquid at ambient temperature and that is miscible with the liquefied solid form of  $A_1^+X_1^-$ .

76. (new) The method of claim 68, wherein,  
said  $A_1^+X_1^-$  is an ionic liquid that is liquid at ambient temperature, and

said functionalized salt  $A_2^+X_2^-$  is selected from the group consisting of: an ionic liquid that is solid at ambient temperature and that is soluble or partially soluble in the liquid form of  $A_1^+X_1^-$  within a temperature range from approximately 25°C to approximately 250°C, and an ionic liquid that is liquid at ambient temperature and that is miscible with the liquid form of  $A_1^+X_1^-$ .

77. (new) The method of claim 69, wherein said ionic liquid  $A_1^+X_1^-$  is selected from the group consisting of: an ionic liquid that is liquid at ambient temperature, and an ionic liquid that is solid at ambient temperature and is liquefiable within a temperature range from approximately 25°C to approximately 250°C.

78. (new) The method of claim 65, wherein said ionic liquid of formula  $A_1^+X_1^-$  has a viscosity less than or equal to approximately 1500 cp (15 N.s/m<sup>2</sup>).

79. (new) A stable composition comprising, in solution:

an ionic liquid of formula  $A_1^+X_1^-$  providing a liquid matrix; and

one functionalized salt of formula  $A_2^+X_2^-$  providing a soluble reaction support and being dissolved in the liquid matrix so that the composition forms a homogeneous phase, wherein,

$A_1^+$  is a non-functional cation or a mixture of cations in which none of the cations is functional,

$X_1^-$  is a non-functional anion or a mixture of anions in which none of the anions is functional,

$A_2^+$  is selected from the group consisting of a functional cation, a non-functional cation, a mixture of cations in which none of the cations is functional, and a mixture of cations in which at least one cation is functional,

$X_2^-$  is selected from the group consisting of a functional anion, a non-functional anion, a mixture of anions in which none of the anions is functional, and a mixture of anions in which at least one anion is functional,

at least one of  $A_2^+$  and  $X_2^-$  is a functional ion,

said functional cation is of a formula  $Y^+-L-F_i$  and said functional anion is of a formula  $Y^--(L)_k-F_i$ ,

$Y^+$  and  $Y^-$  are ionic entities that carry the charge of the cation and the charge of the anion, respectively, linked via a linker L to at least one function  $F_i$ ,

L is an alkyl group of 1 to 20 carbon atoms,

$F_i$  varies from  $F_0$  to  $F_n$ , n being an integer varying from 1 to 10, with  $F_0$  being a function initially linked to said cationic entities and anionic entities and  $F_1$  to  $F_{10}$  being functions converted from said  $F_0$  after sequential and subsequent reactions with said cationic or anionic entities,

said function  $F_i$  is selected from the group consisting of hydroxyl, carboxylic, amide, sulphone, primary amine, secondary amine, aldehyde, ketone, ethenyl, ethynyl, dienyl, ether, epoxide, primary phosphine, secondary phosphine, tertiary phosphine, azide, imine, ketene, cumulene, heterocumulene, thiol, thioether, sulphoxide, phosphorus-containing moieties, heterocycles, sulphonic acid, silane, stannane and functional aryl functions,



k is equal to 0 or 1 so that when k is equal to 0,  $Y^-F_i$  is selected from the group consisting of  $OH^-$ ,  $F^-$ ,  $CN^-$ ,  $RO^-$  and  $RS^-$ , and

R is an alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms.

80. (new) A stable composition comprising:

an ionic liquid of formula  $A_1^+X_1^-$  with a first part providing a liquid matrix of  $A_1^+$  and/or  $X_1^-$  ionic entities linked to one or more initial functions  $F_0$  and a second part providing a functionalized salt as a soluble reaction support, the liquid matrix and functionalized salt forming a homogeneous phase, wherein,

the functionalized salt converts the one or more initial functions  $F_0$  into first novel functions of the second part of the ionic liquid, and

the first novel functions of the second part of the ionic liquid are capable of being subsequently converted to other functions, without affecting the initial function or functions  $F_0$  of the first part of the ionic liquid.

81. (new) The composition of claim 79, wherein the  $A_2^+$  cation and/or the  $X_2^-$  anion of the functionalized salt or salts, corresponding to a  $Y^-$  ionic entity linked to at least one function  $F_1$ , are immobilized in the liquid matrix and cannot be extracted from the liquid matrix by solvent extraction.

82. (new) The composition of claim 79, wherein, the liquid matrix is non-reactive vis-à-vis the functionalized salt.

83. (new) The composition of claim 79, wherein  $A_2^+$  is a functional cation.

84. (new) The composition of claim 83, wherein the  $X_1^-$  and  $X_2^-$  anions are identical.

85. (new) The composition of claim 83, wherein, the  $A_1^+$  and  $A_2^+$  cations are onium cations selected from the group consisting of substituted or non-substituted pyridinium, imidazolium, ammonium, phosphonium or sulphonium cations, and

the  $X_1^-$  and  $X_2^-$  anions are selected from the group consisting of non-complex anions and complex anions, wherein,

the non-complex anions are selected from the group consisting of  $BF_4^-$ ,  $PF_6^-$ ,  $CF_3SO_3^-$ ,  $CH_3COO^-$ ,  $CF_3CO_2^-$ ,  $\bar{N}(SO_2CF_3)_2$ , halides,  $BR_4^-$ ,  $RCO_2^-$  and  $RSO_3^-$  with R selected from the group consisting of an alkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a perfluorinated group and partially fluorinated group, and  $R'SO_4^-$  anions with R' selected from the group consisting of a hydrogen atom, a methyl group and an ethyl group, and

the complex anions result from the combination of a Lewis acid and a halide X, said complex anion being of the general formula  $MX_j$  with j being an integer between 1 and 7, and

M representing a metal selected from the group consisting of aluminum, tin, zinc, bismuth, manganese, iron, copper, molybdenum, antimony, gallium or indium.

86. (new) The composition of claim 79, wherein,

the  $Y^{+}$ - cationic entity carries the positive charge of the cation and is linked via a linker L to a function  $F_0$ ,

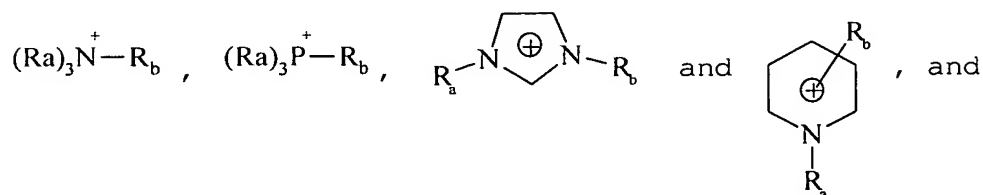
L is an alkyl group comprising 1 to 20 carbon atoms, and

function  $F_0$  is selected from the group consisting of hydroxyl, carboxylic, amide, sulphone, primary amine, secondary amine, aldehyde, ketone, ethenyl, ethynyl, dienyl, ether, epoxide, phosphine (primary, secondary or tertiary), azide, imine, ketene, cumulene, heterocumulene, thiol, thioether, sulphoxide, phosphorus-containing moieties, heterocycles, sulphonic acid, silane, stannane and functional aryl functions.

87. (new) The composition of claim 79, wherein,

$X_1^{-}$  is selected from the group consisting of:  $NTf_2^{-}$ ,  $PF_6^{-}$ ,  $BF_4^{-}$  and  $CF_3SO_3^{-}$ ,

$A_1^{+}$  is selected from the group consisting of:



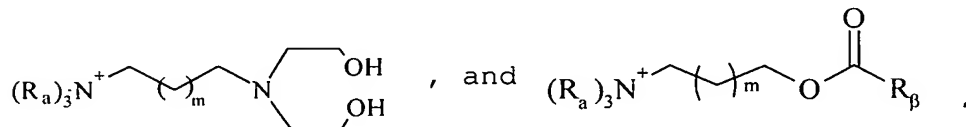
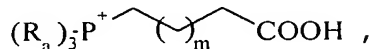
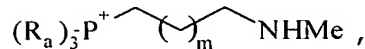
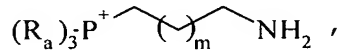
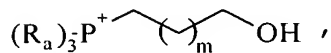
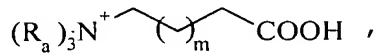
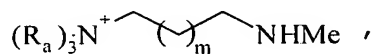
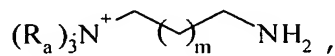
$R_a$  and  $R_b$  are linear or branched alkyl groups of 1 to

20 carbon atoms, functional alkyl groups of 1 to 20 carbon atoms, or functional or non-functional aryl groups of 6 to 30 carbon atoms.

88. (new) The composition of claim 79, wherein

$X_2^-$  is selected from the group consisting of:  $NTf_2^-$ ,  $PF_6^-$ ,  $BF_4^-$ ,  $Cl^-$ ,  $Br^-$ ,  $I^-$ ,  $CF_3SO_3^-$ ,  $MeSO_4^-$ ,  $EtSO_4^-$ ,  $MeSO_3^-$ ,  $C_6H_5SO_3^-$ , and  $pMeC_6H_4SO_3^-$ ,

$A_2^+$  is selected from the group consisting of:



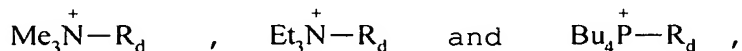
$m$  is an integer comprised between 0 and 20,

$R_\beta$  is selected from the group consisting of a substituted or non-substituted vinyl group, a functional aryl group of 1 to 20 carbon atoms, and a functional alkyl group of 6 to 30 carbon atoms, and

$R_a$  is a branched or non-branched alkyl group of 1 to 20 carbon atoms.

89. (new) The composition of claim 79, wherein,

$A_2^+$  is selected from the group consisting of



$R_d$  is an alkyl group comprising 1 to 20 carbon atoms,

$X_2^-$  is a functional anion corresponding to an anion of a conjugated acid having a  $pK_A$  less than 30, and is selected from the group consisting of:  $\text{OH}^-$ ,  $\text{F}^-$ ,  $\text{R}_c\text{BZ}_3^-$ ,  $\text{N}_3^-$ ,  $\text{CN}^-$ , and  $\text{WCR}_c\text{V}^-$ ,

$Z$  is  $-\text{F}$ ,  $-\text{OH}$ , or an  $-\text{OR}$  group,  $R$  being an alkyl group comprising 1 to 20 carbon atoms,

$V$  and  $W$  are, independently of each other, an electroattractive group selected from the group consisting of a cyano, an alkoxy carbonyl moiety of 2 to 20 carbon atoms, acyl moiety of 2 to 20 carbon atoms, benzoyl, alkyl sulphonyl moiety of 1 to 20 carbon atoms, aryl sulphonyl moiety of 6 to 30 carbon atoms, and dialkoxyphosphonyl moiety of 2 to 20 carbon atoms, and

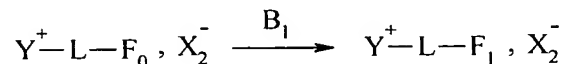
$R_c$  is selected from the group consisting of a branched, non-branched, cyclic or non-cyclic alkyl moiety of 1 to 20 carbon atoms and an aryl moiety of 6 to 30 carbon atoms.

90. (new) A method of organic synthesis, comprising preparing the composition of claim 79 by combining a liquid matrix including at least an ionic liquid of formula  $A_1^+X_1^-$  with at least one functionalized salt of formula  $A_2^+X_2^-$ , wherein said

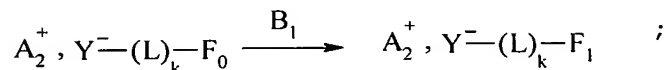
organic synthesis is continuous, discontinuous, combinatorial, parallel, and/or for preparing libraries of products.

91. (new) A method for the preparation of a molecule G having an initial function  $F_0$  via an L linker of an alkyl group of 1 to 20 carbon atoms to a  $Y^+$ -ionic entity forming part of the  $A_2^+$  cation of the  $A_2^+X_2^-$  of claim 79 and/or  $Y^-$ - functionalized salt, forming part of the  $X_2^-$  anion of the  $A_2^+X_2^-$ -functionalized salt of claim 79, the cation being in the form  $Y^+-L-F_0$  and/or the anion being in the form  $Y^--(L)_k-F_0$ , k being equal to 0 or 1, comprising:

adding a reagent  $B_1$  to the composition of claim 79 to react with function  $F_0$  and produce a function  $F_1$ ,  $F_1$  being linked to the  $Y^+$ - ionic entity, forming part of the  $A_2^+$  cation of the  $A_2^+X_2^-$  functionalized salt, and/or to the  $Y^-$ - ionic entity, forming part of the  $X_2^-$  anion of the  $A_2^+X_2^-$  functionalized salt, according to one of

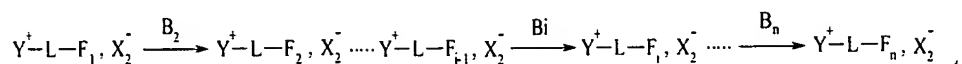


and

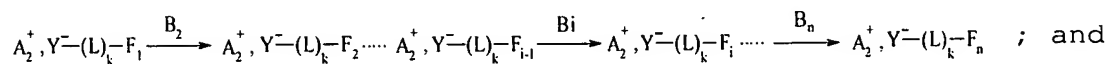


adding  $B_i$  reagents in n-1 successive steps,  $1 < i \leq n$ , n varying from 2 to 10, to the composition of claim 79 reacted with  $B_1$  so that each reagent  $B_i$  reacts with a function  $F_{i-1}$ , leading to the obtaining of a function  $F_i$ , the (n-1)<sup>th</sup> addition of

the reagent  $B_n$  to the function  $F_{n-1}$  leading to the obtaining of the function  $F_n$ , the  $n-1$  successive reactions steps according to one of



and

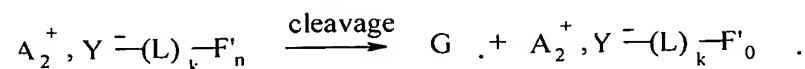
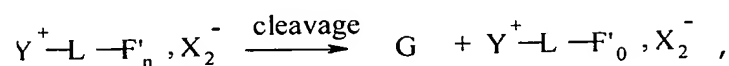
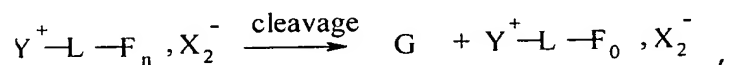


cleaving the function  $F_n$  to recover the molecule  $G$  and the  $A_2^+X_2^-$  functionalized salt, wherein

$F_n$  is linked to the  $Y^+$ - or  $Y^-$ - ionic entity, of the  $X_2^-$  anion or  $A_2^+$  cation, respectively,

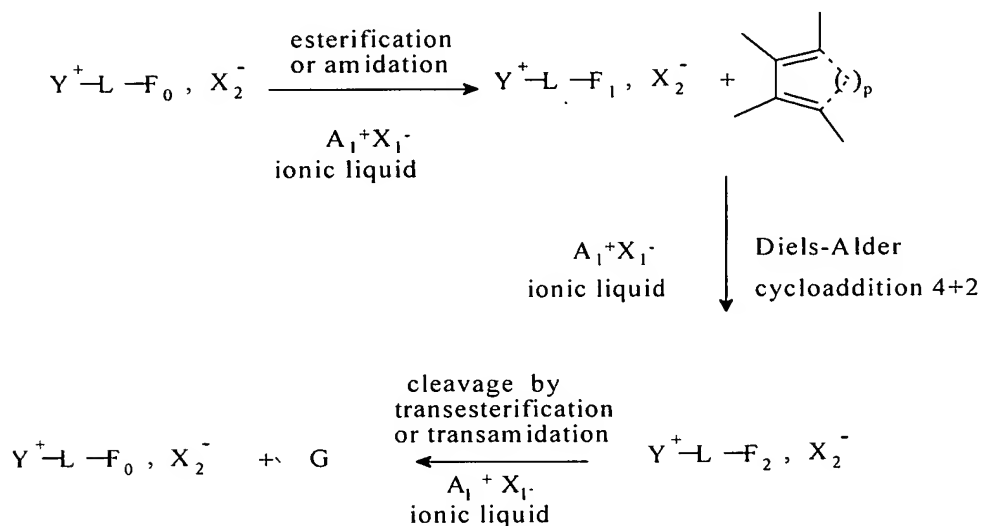
the  $A_2^+X_2^-$  functionalized salt is recovered in the form  $Y^+-L-F_0, X_2^-$  or  $A_2^+, Y^-(L)_k-F_0$  and in solution in the  $A_1^+X_1^-$  ionic liquid matrix or in the form  $Y^+-L-F'_0, X_2^-$  or  $A_2^+, Y^-(L)_k-F'_0$ , in which  $F'_0$  represents a function different from  $F_0$ , and

said cleaving is selected from the group consisting of:



92. (new) The method of claim 91, wherein,  
adding a reagent B<sub>1</sub> is an esterification or amidation  
step and adding a reagent B<sub>2</sub> is a Diels-Alder reaction step such  
that the adding reagents and cleaving steps are according to one  
of reaction (a) and reaction (b);

reaction (a) is defined as



wherein,

p is an integer varying from 0 to 2,

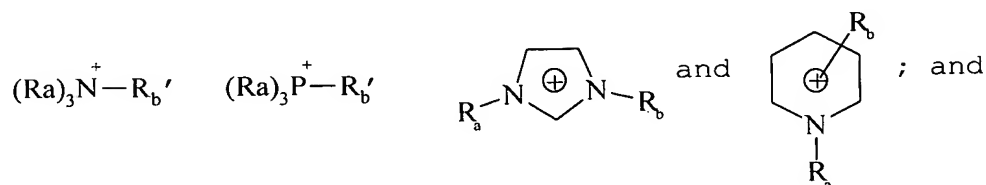
Y<sup>+</sup>- is a substituted or non-substituted onium cation  
selected from the group consisting of the substituted or non-  
substituted pyridinium, imidazolium, ammonium, phosphonium and  
sulphonium cations,



L is selected from the group consisting of linear alkyl group of 1 to 20 carbon atoms, a branched alkyl group of 1 to 20 carbon atoms, and a functional aralkyl group of 6 to 30 carbon atoms,

$X_2^-$  is selected from the group consisting of  $NTf_2^-$ ,  $BF_4^-$ ,  $PF_6^-$ ,  $Cl^-$ ,  $Br^-$ ,  $CH_3COO^-$ ,  $CF_3CO_2^-$ ,  $CF_3SO_3^-$ , and  $BR_4^-$ ,

$A_1^+$  is selected from the group consisting of:



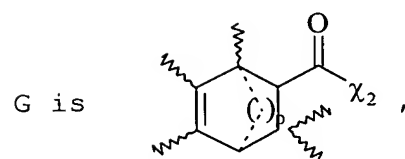
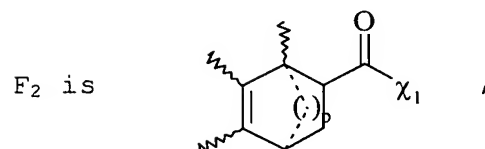
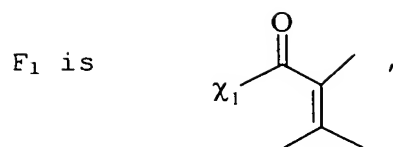
$R_a$  and  $R_b$  are each selected from the group consisting of linear or branched alkyl groups, of 1 to 20 carbon atoms, functional alkyl groups of 1 to 20 carbon atoms, and functional or non-functional aryl groups of 6 to 30 carbon atoms,

$X_1^-$  is selected from the group consisting of:  $BF_4^-$ ,  $PF_6^-$ ,  $NTf_2^-$ ,  $Cl^-$ ,  $Br^-$ ,  $CH_3COO^-$ ,  $CF_3CO_2^-$ ,  $CF_3SO_3^-$ , and  $BR_4^-$ ,

R is selected from the group consisting of an alkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a perfluorinated group, partially fluorinated group, and the  $R'SO_4^-$  anions,

$R'$  is selected from the group consisting of a hydrogen atom, a methyl group or an ethyl group,

$F_0$  is a  $-\chi_1H$  group,



χ<sub>1</sub> is an oxygen atom or an -NR<sub>f</sub> group,

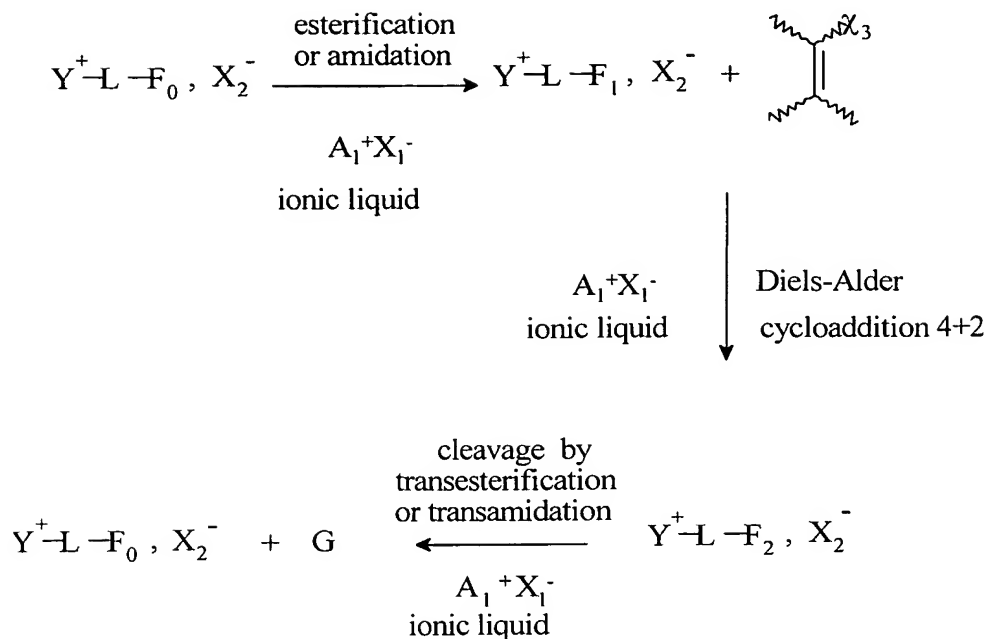
R<sub>f</sub> is linear or branched alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms,

χ<sub>2</sub> is either an OR<sub>g</sub> group or an -NR<sub>h</sub>R<sub>u</sub> group,

R<sub>g</sub> is a hydrogen atom or an alkyl group of 1 to 20 carbon atoms, and

R<sub>h</sub> and R<sub>u</sub> are independently of each other selected from the group consisting of a hydrogen atom , an alkyl group of 1 to 20 carbon atoms, and an aryl group of 6 to 30 carbon atoms; and

reaction(b) being defined as



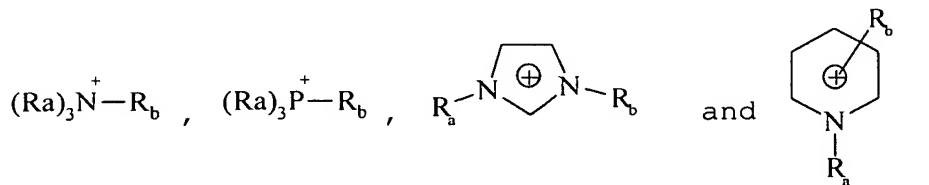
wherein,

$\text{Y}^+$  is a substituted or non-substituted onium cation selected from the group consisting of the substituted or non-substituted pyridinium, imidazolium, ammonium, phosphonium and sulphonium cations,

$\text{L}$  is selected from the group consisting of linear alkyl group of 1 to 20 carbon atoms, a branched alkyl group of 1 to 20 carbon atoms, and a functional aralkyl group of 6 to 30 carbon atoms,

$\text{X}_2^-$  is selected from the group consisting of  $\text{NTf}_2^-$ ,  $\text{BF}_4^-$ ,  $\text{PF}_6^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{CF}_3\text{CO}_2^-$ ,  $\text{CF}_3\text{SO}_3^-$ , and  $\text{BR}_4^-$ ,

$\text{A}_1^+$  is selected from the group consisting of:



$R_a$  and  $R_b$  are each selected from the group consisting of linear or branched alkyl groups, of 1 to 20 carbon atoms, functional alkyl groups of 1 to 20 carbon atoms, and functional or non-functional aryl groups of 6 to 30 carbon atoms,

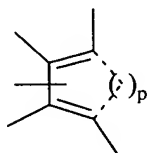
$X_1^-$  is selected from the group consisting of:  $BF_4^-$ ,  $PF_6^-$ ,  $NTf_2^-$ ,  $Cl^-$ ,  $Br^-$ ,  $CH_3COO^-$ ,  $CF_3CO_2^-$ ,  $CF_3SO_3^-$ , and  $BR_4^-$ ,

$R$  is selected from the group consisting of an alkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a perfluorinated group, partially fluorinated group, and  $R'SO_4^-$  anions,

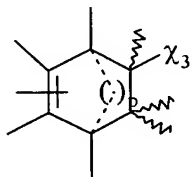
$R'$  is selected from the group consisting of a hydrogen atom, a methyl group and an ethyl group,

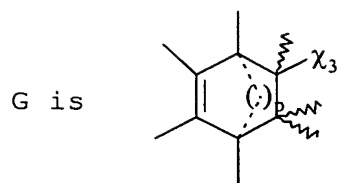
$F_0$  is a function of 1 to 20 carbon atoms selected from the group consisting of carbonyl, amine, alkoxy, silane, stannane and borane,

$F_1$  is



$F_2$  is



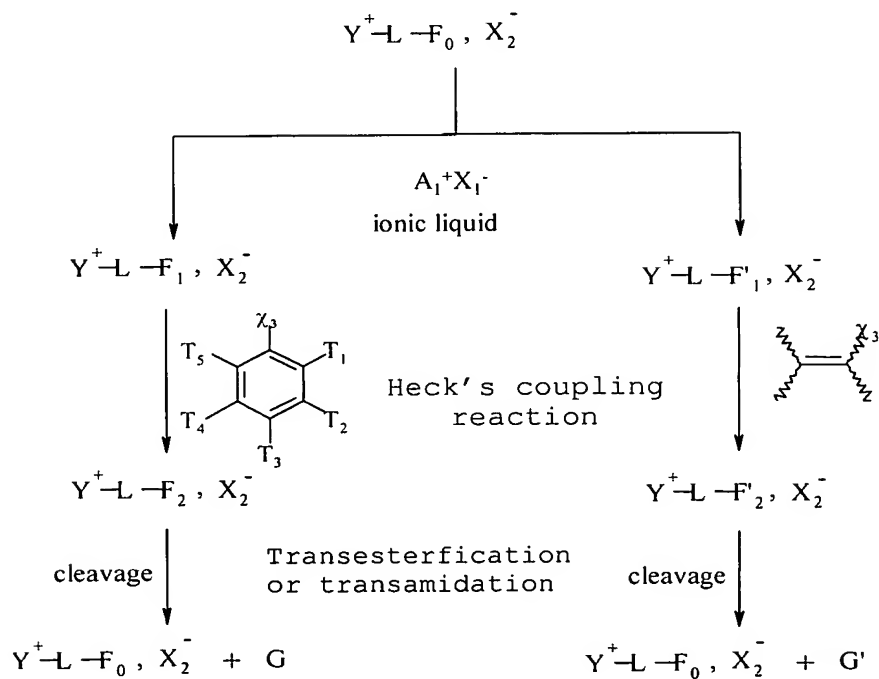


p being an integer varying from 0 to 2, and

$\chi_3$  is an electroattractive group selected from the group consisting of cyano groups, alkoxycarbonyl groups of 1 to 20 carbon atoms, acyl groups of 2 to 20 carbon atoms, benzoyl, sulphonyl, and dialkoxyposphonyl groups of 1 to 10 carbon atoms.

93. (new) The method of claim 91, wherein,

adding a reagent  $B_1$  is an esterification or amidation step and adding a reagent  $B_2$  is a Heck's coupling reaction step such that the adding reagents and cleaving steps are defined as:



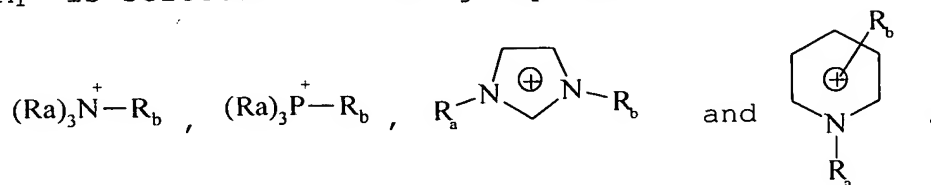
wherein,

$Y^{+-}$  is a trimethylalkylammonium, triethylalkylammonium or tributylalkylphosphonium cation,

L is selected from the group consisting of a linear alkyl group of 1 to 20 carbon atoms, a branched alkyl group of 1 to 20 carbon atoms, and a functional aralkyl group of 6 to 30 carbon atoms,

$X_2^-$  is selected from the group consisting of  $BF_4^-$ ,  $PF_6^-$ ,  $NTf_2^-$ ,  $CF_3SO_3^-$ ,  $Cl^-$ ,  $Br^-$ , and  $I^-$ ,

$A_1^+$  is selected from the group consisting of:



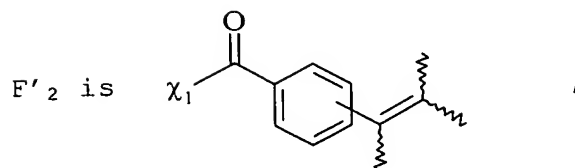
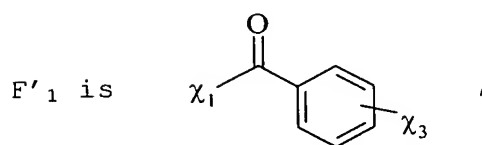
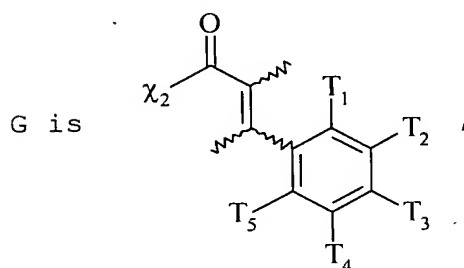
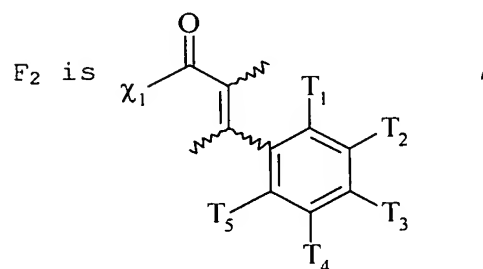
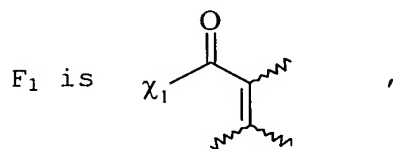
$R_a$  and  $R_b$  are each selected from the group consisting of linear or branched alkyl groups, of 1 to 20 carbon atoms, functional alkyl groups of 1 to 20 carbon atoms, and functional or non-functional aryl groups of 6 to 30 carbon atoms,

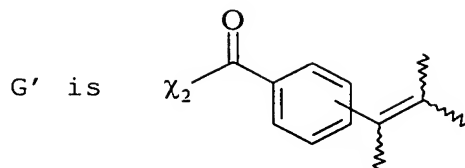
$X_1^-$  is selected from the group consisting of:  $BF_4^-$ ,  $PF_6^-$ ,  $NTf_2^-$ ,  $Cl^-$ ,  $Br^-$ ,  $CH_3COO^-$ ,  $CF_3CO_2^-$ ,  $CF_3SO_3^-$ , and  $BR_4^-$ ,

R is selected from the group consisting of an alkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a perfluorinated group, partially fluorinated group, and the  $R'SO_4^-$  anions,

R' is selected from the group consisting of a hydrogen atom, a methyl group and an ethyl group,

F<sub>0</sub> is a -χ<sub>1</sub>H group,





$\chi_1$  is an oxygen atom or an  $-NR_f$  group,

$R_f$  is linear or branched alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms,

$\chi_2$  is either an  $OR_g$  group or an  $-NR_hR_u$  group,

$R_g$  is a hydrogen atom or an alkyl group of 1 to 20 carbon atoms,

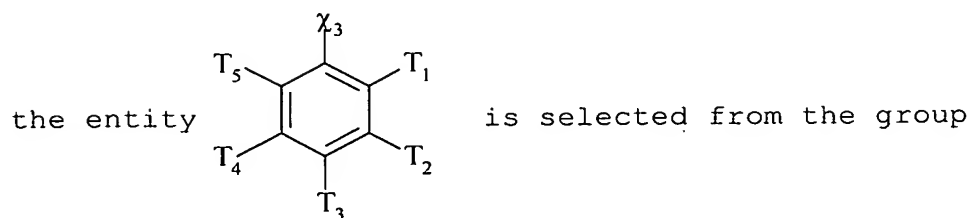
$R_h$  and  $R_u$  are independently of each other selected from the group consisting of a hydrogen atom, an alkyl group of 1 to 20 carbon atoms, and an aryl group of 6 to 30 carbon atoms,

$\chi_3$  is a leaving moiety selected from the group consisting of I, Cl, Br, mesylate, tosylate, triflate, sulphonate, sulphate and phosphate groups,

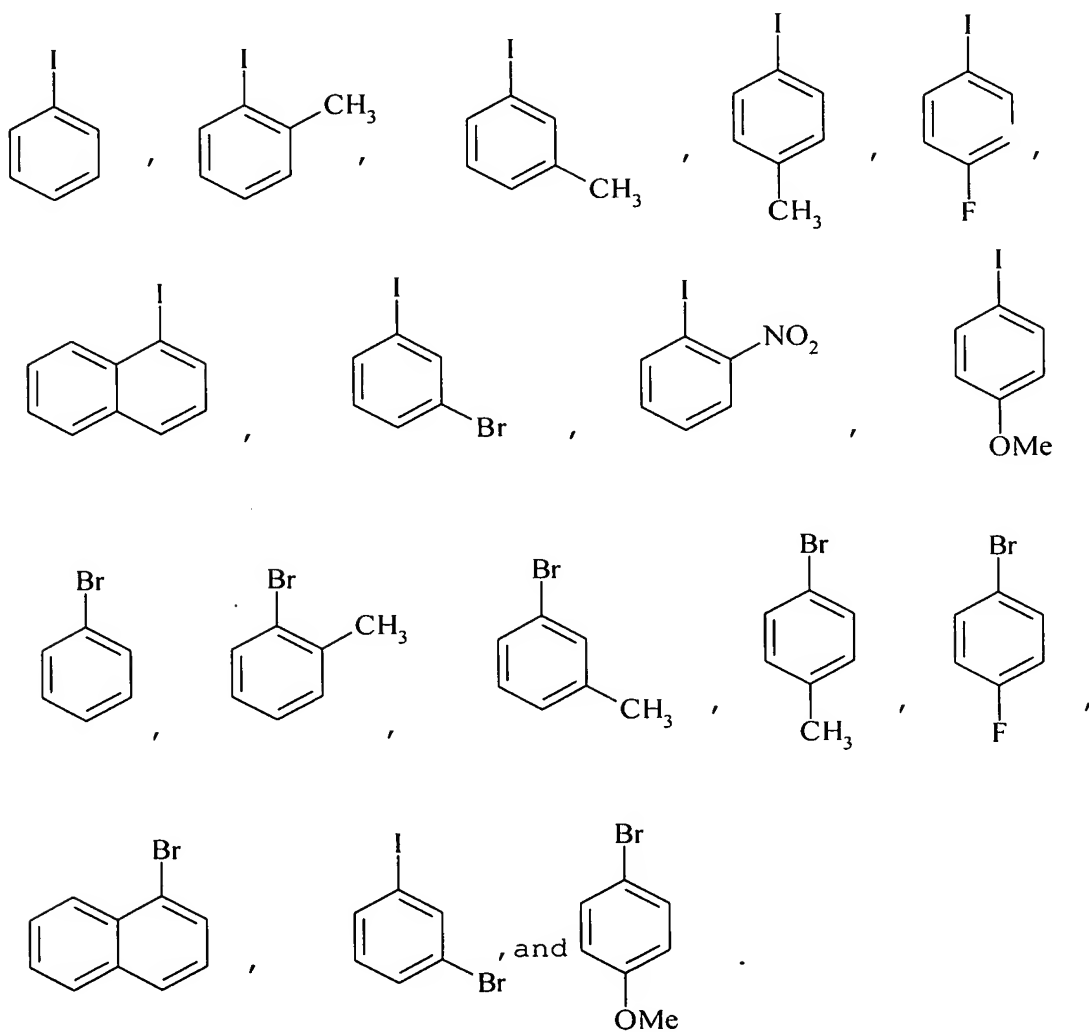
$T_1$ ,  $T_2$ ,  $T_3$ ,  $T_4$  and  $T_5$  are each independently of one another selected from the group consisting of a hydrogen atom, a linear or branched alkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms,  $NO_2$ , CN, COOR, OR, COR, NHCOR,  $NRR''$ ,  $SO_2R$ , I, and Br,



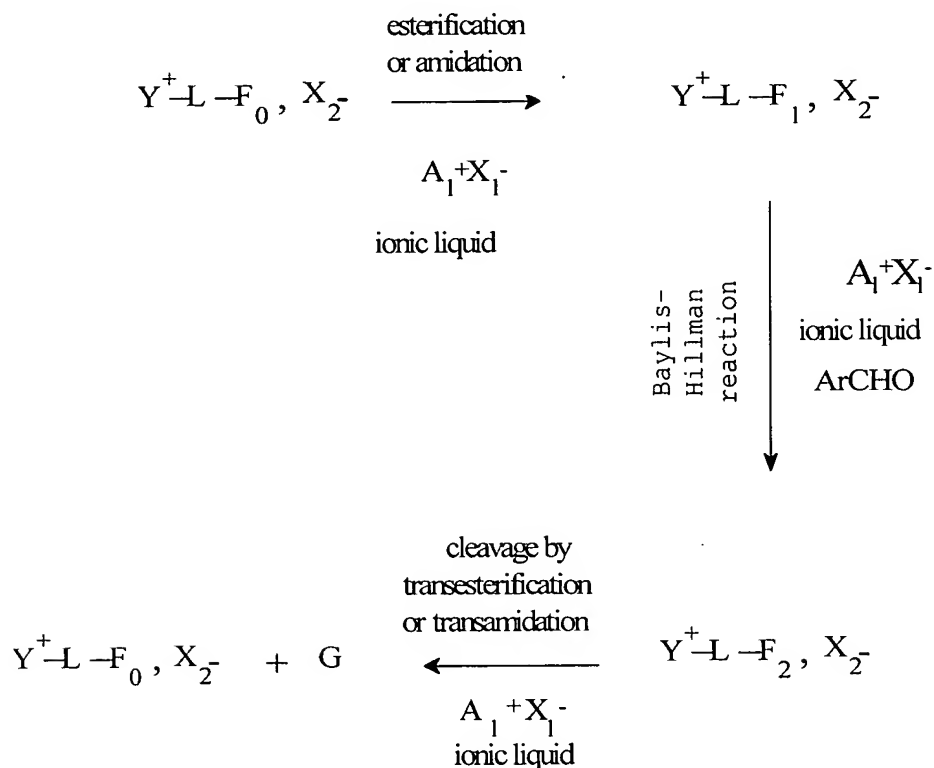
R and R'' are each independently of each other an alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms, and



consisting of:



94. (new) The method of claim 91, wherein,  
adding a reagent B<sub>1</sub> is an esterification or amidation  
step and adding a reagent B<sub>2</sub> is a Baylis-Hillman reaction step  
such that the adding reagents and cleaving steps are as follows:



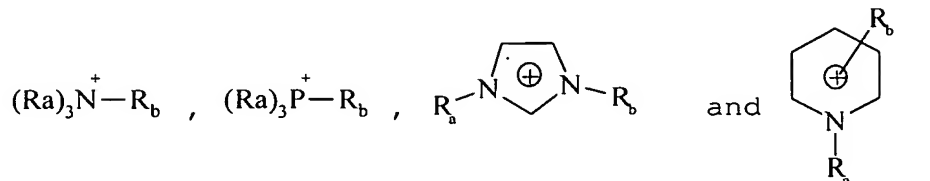
wherein,

Y<sup>+</sup>- is a trimethylalkylammonium, triethylalkylammonium  
or tributylalkylphosphonium cation,

L is selected from the group consisting of a linear  
alkyl group of 1 to 20 carbon atoms, a branched alkyl group of 1  
to 20 carbon atoms, and a functional aralkyl group of 6 to 30  
carbon atoms,

$X_2^-$  is selected from the group consisting of  $BF_4^-$ ,  $PF_6^-$ ,  $NTf_2^-$ ,  $CF_3SO_3^-$ ,  $Cl^-$ ,  $Br^-$ , and  $I^-$ ,

$A_1^+$  is selected from the group consisting of:



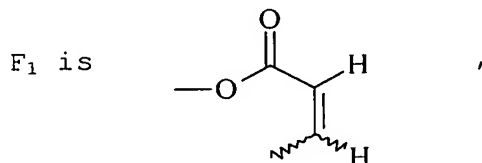
$R_a$  and  $R_b$  are each selected from the group consisting of linear or branched alkyl groups, of 1 to 20 carbon atoms, functional alkyl groups of 1 to 20 carbon atoms, and functional or non-functional aryl groups of 6 to 30 carbon atoms,

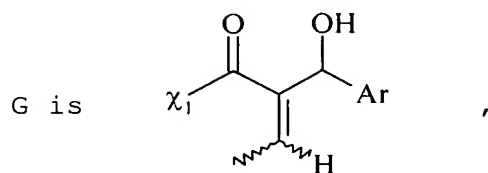
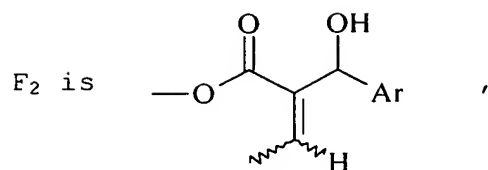
$X_1^-$  is selected from the group consisting of:  $BF_4^-$ ,  $PF_6^-$ ,  $NTf_2^-$ ,  $Cl^-$ ,  $Br^-$ ,  $CH_3COO^-$ ,  $CF_3CO_2^-$ ,  $CF_3SO_3^-$ , and  $BR_4^-$ ,

$R$  is selected from the group consisting of an alkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a perfluorinated group, partially fluorinated group, and the  $R'SO_4^-$  anions,

$R'$  is selected from the group consisting of a hydrogen atom, a methyl group and an ethyl group,

$F_0$  is an  $-OH$  group,

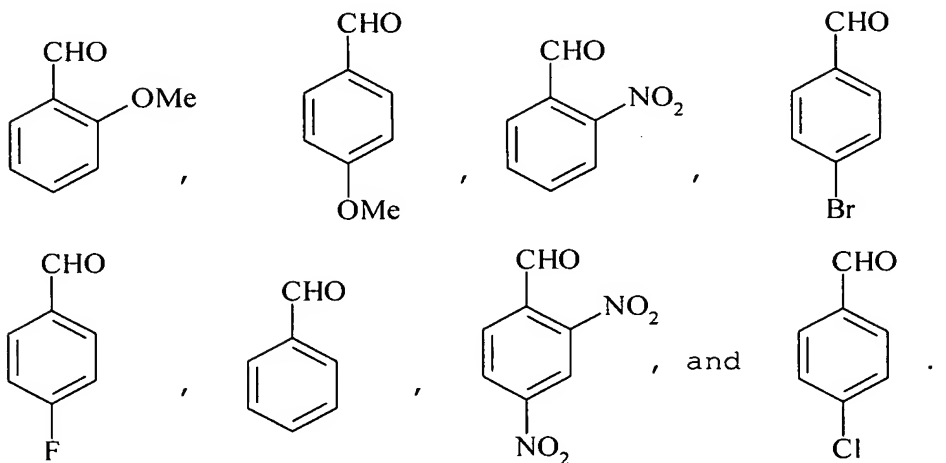




chi<sub>1</sub> is an -OH group or an -OR<sub>g</sub> group,

R<sub>g</sub> is a linear or branched alkyl group of 1 to 20 carbon atoms,

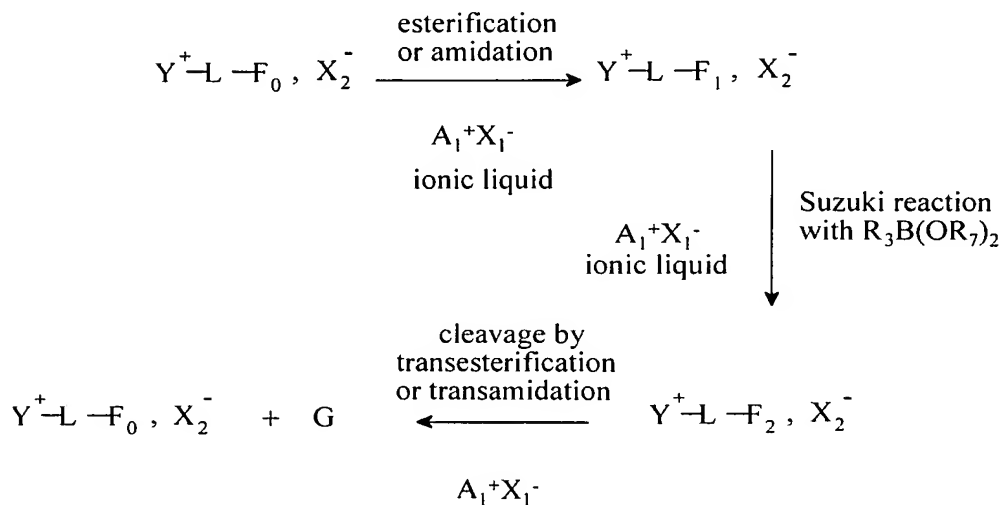
ArCHO is selected from the group consisting of:



95. (new) The method of claim 91, wherein,

adding a reagent B<sub>1</sub> is an esterification or amidation step and adding a reagent B<sub>2</sub> is a Suzuki coupling reaction step such that the adding reagents and cleaving steps, in combination, are selected from the group consisting of reaction (a), reaction (b), reaction (c), and reaction (d);

reaction (a) being defined as



wherein,

R<sub>3</sub> is the substituted or non-substituted groups of 2 to 30 carbon atoms selected from the group consisting of aryl, heteroaryl, ethenyl, dienyl, allyl and ethynyl,

R<sub>7</sub> is a branched or linear alkyl group or a cycloalkyl group of 1 to 12 carbon atoms,

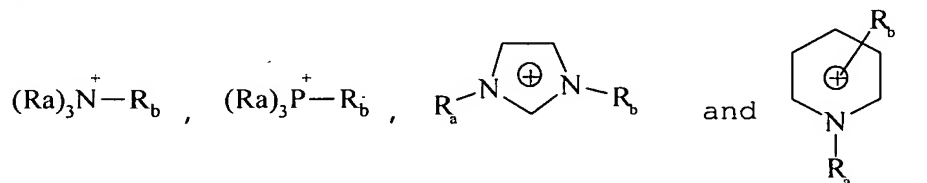
Y<sup>+</sup>- is a trimethylalkylammonium, triethylalkylammonium or tributylalkylphosphonium cation,

L is selected from the group consisting of a linear

alkyl group of 1 to 20 carbon atoms, a branched alkyl group of 1 to 20 carbon atoms, and a functional aralkyl group of 6 to 30 carbon atoms,

$X_2^-$  is selected from the group consisting of  $BF_4^-$ ,  $PF_6^-$ ,  $NTf_2^-$ ,  $CF_3SO_3^-$ ,  $Cl^-$ ,  $Br^-$ , and  $I^-$ ,

$A_1^+$  is selected from the group consisting of:



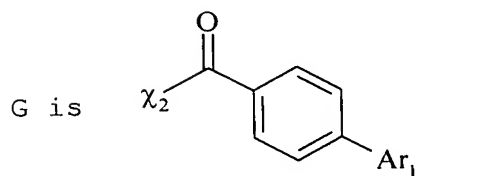
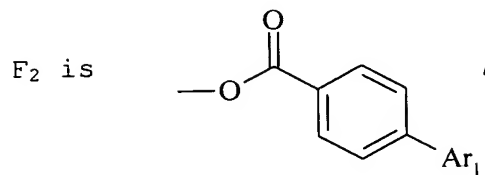
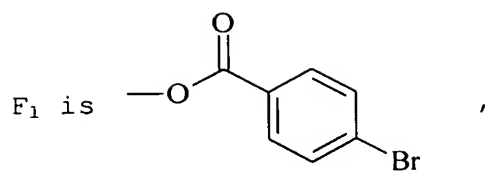
$R_a$  and  $R_b$  are each selected from the group consisting of linear or branched alkyl groups, of 1 to 20 carbon atoms, functional alkyl groups of 1 to 20 carbon atoms, and functional or non-functional aryl groups of 6 to 30 carbon atoms,

$X_1^-$  is selected from the group consisting of:  $BF_4^-$ ,  $PF_6^-$ ,  $NTf_2^-$ ,  $Cl^-$ ,  $Br^-$ ,  $CH_3COO^-$ ,  $CF_3CO_2^-$ ,  $CF_3SO_3^-$ , and  $BR_4^-$ ,

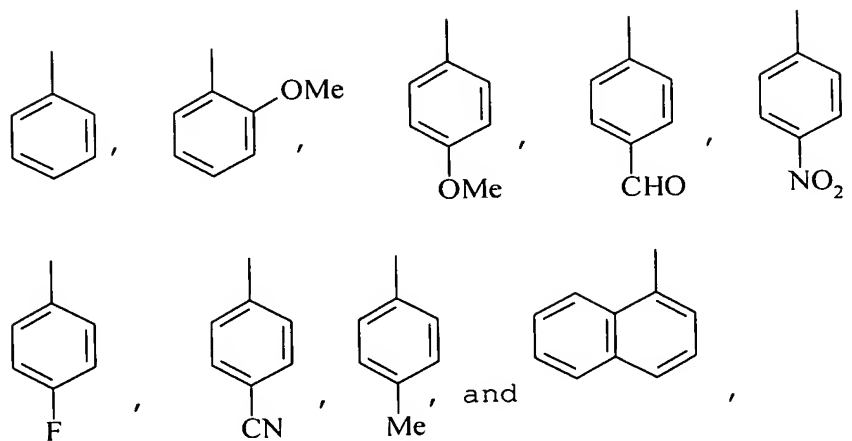
$R$  is selected from the group consisting of an alkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a perfluorinated group, partially fluorinated group, and the  $R'SO_4^-$  anions,

$R'$  is selected from the group consisting of a hydrogen atom, a methyl group and an ethyl group,

$F_0$  is  $-\chi_1H$ ,



Ar<sub>1</sub> is an aromatic group selected from the group consisting of:



chi<sub>1</sub> is an oxygen atom or an -NR<sub>f</sub> group,

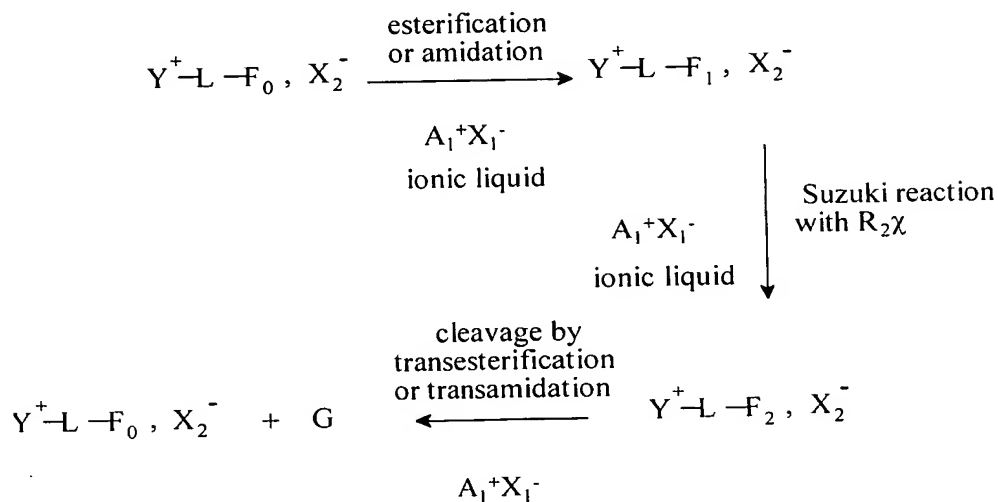
$R_f$  is a linear or branched alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms,

$\chi_2$  is either an  $OR_g$  group or an  $-NR_hR_u$  group,

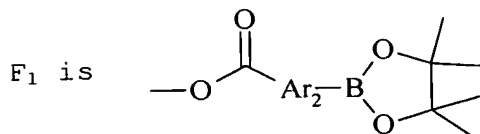
$R_g$  is a hydrogen atom or an alkyl group of 1 to 20 carbon atoms, and

$R_h$  and  $R_u$  are independently of each other selected from the group consisting of a hydrogen atom, an alkyl group of 1 to 20 carbon atoms, and an aryl group of 6 to 30 carbon atoms;

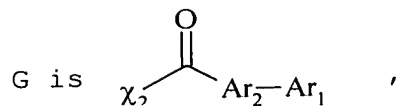
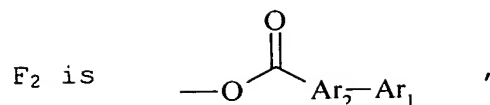
reaction (b) being defined as



$F_0$  is in the form  $-\chi_1H$ ,



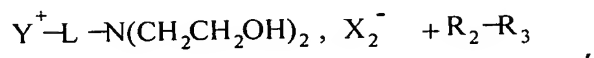
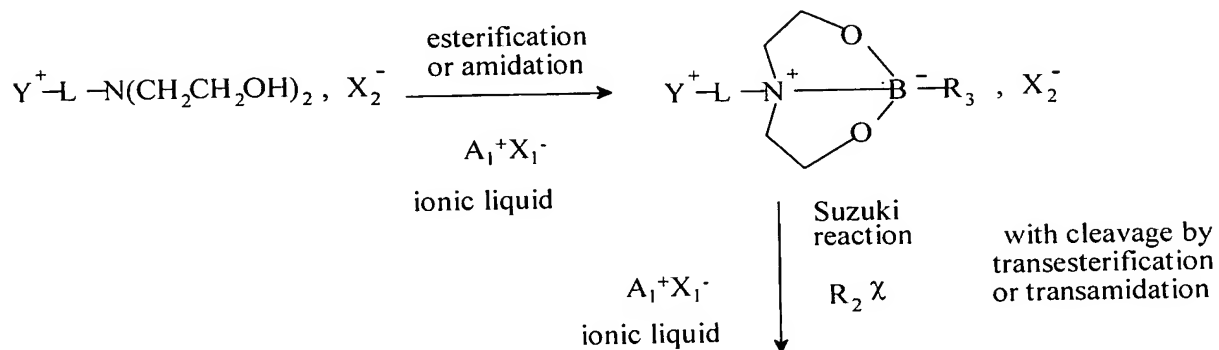




Ar<sub>2</sub> is a substituted or non-substituted aryl group of 6 to 30 carbon atoms, and

Y<sup>+</sup>-, L, X<sub>2</sub><sup>-</sup>, A<sub>1</sub><sup>+</sup>, X<sub>1</sub><sup>-</sup>, Ar<sub>1</sub>, X<sub>1</sub> and R<sub>7</sub> are as defined above for reaction a);

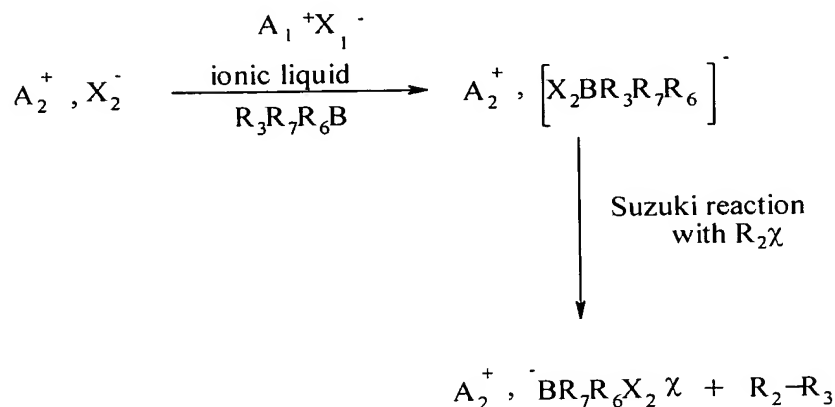
reaction (c) being defined as



wherein Y<sup>+</sup>-, L, X<sub>2</sub><sup>-</sup>, A<sub>1</sub><sup>+</sup>, X<sub>1</sub><sup>-</sup> and R<sub>3</sub> are as defined above for reaction (a), and

$R_2$  is a substituted or non-substituted group of 2 to 30 carbon atoms selected from the group consisting of aryl, heteroaryl, ethenyl, dienyl, allyl, and ethynyl; and

reaction (d) being defined as



$A_2^+$  is  $(R_a)_3 N^+ R_b$  ammonium or  $(R_a)_3 P^+ R_b$  phosphonium,

$R_a$  and  $R_b$  are each selected from the group consisting of linear or branched alkyl groups, of 1 to 20 carbon atoms, functional alkyl groups of 1 to 20 carbon atoms, and functional or non-functional aryl groups of 6 to 30 carbon atoms,

$X_2^-$  is selected from the group consisting of  $OH^-$ ,  $F^-$ ,  $CN$ ,  $R_s O^-$ , and  $R_s S^-$ ,

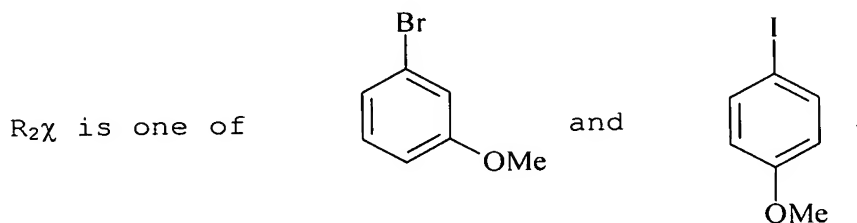
$R_s$  is an alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms,

$R_2$  is a substituted or non-substituted group of 2 to 30 carbon atoms selected from the group consisting of aryl, heteroaryl, ethenyl, dienyl, allyl, and ethynyl,

$R_3$  is the substituted or non-substituted groups of 2 to 30 carbon atoms selected from the group consisting of aryl, heteroaryl, ethenyl, dienyl, allyl and ethynyl,

$R_6$  and  $R_7$  are each independently of each other an alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms,

$R_3R_7R_6B$  is selected from the groups consisting of a trialkyl borane with the alkyl group being 1 to 20 carbon atoms, an aryl borane with the aryl group being 6 to 30 carbon atoms, a boronic acid, and boronic acid ester,



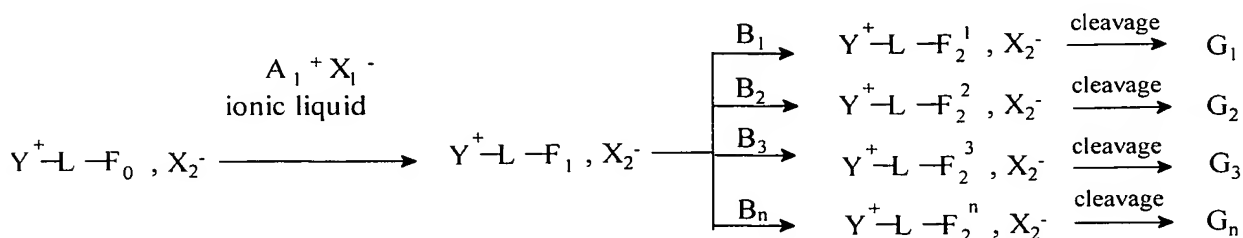
96. (new) The method of claim 68, further comprising separating the  $Y^+-L-F_1$ ,  $X_2^-$  functionalized salt in the  $A_1^+$ ,  $X_1^-$  ionic liquid into n approximately equal parts, n is 2 to 1024;

converting each  $Y^+-L-F_1$ ,  $X_2^-$  functionalized salt by an organic synthesis with a different reagent  $B_i$  in order to produce

n solutions each containing a defined  $Y^+-L-F_2^i$ ,  $X_2^-$  compound,  
 $F_2^i$  representing one of the functions, i varying from 1 to n;

cleaving each  $Y^+-L-F_2^i$ ,  $X_2^-$  compound to release  $G_i$   
molecule i varying from 1 to n; and

isolating and purifying each  $G_i$  molecule to obtain a  
molecular library, wherein said separating, converting and  
cleaving according to the reaction



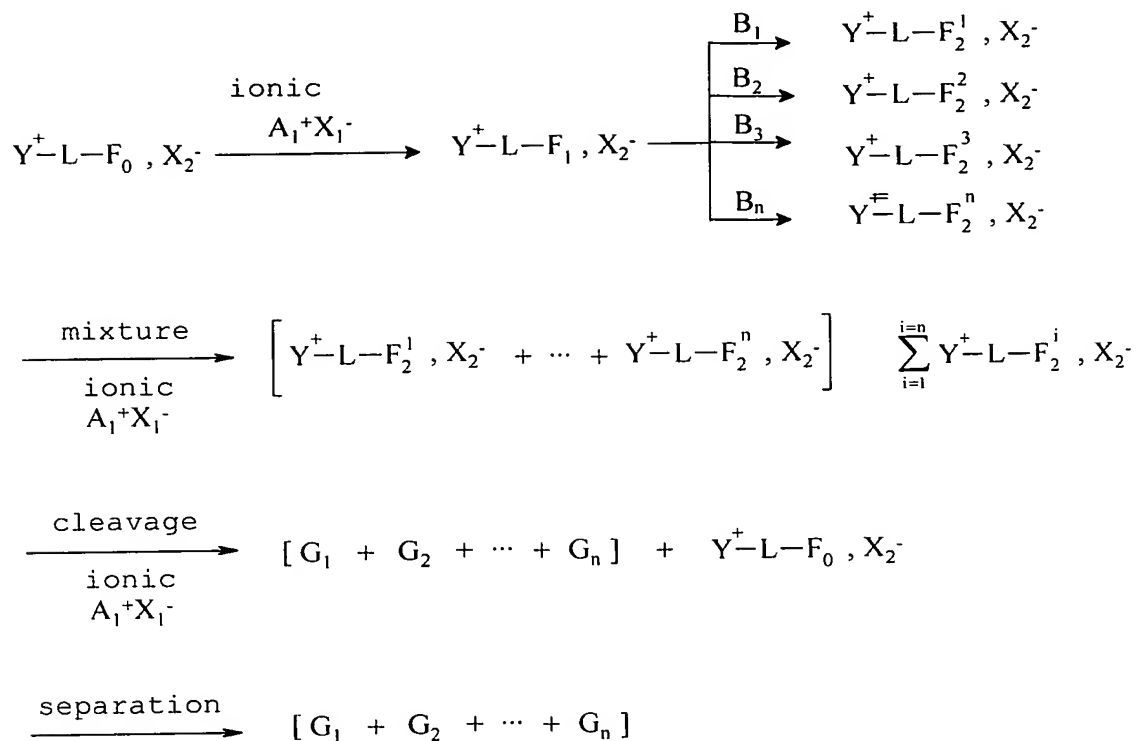
97. (new) The method of claim 68, further comprising  
obtaining n fractions of the  $Y^+-L-F_1$ ,  $X_2^-$  solution from  
the  $Y^+-L-F_0$ ,  $X_2^-$  functionalized salt, in the  $A_1^+X_1^-$  ionic liquid;  
converting said n fractions in parallel according to an  
organic chemistry reaction, each using a different reagent  $B_i$  in  
order to produce n solutions, each solution containing defined  
 $Y^+-L-F_2^i$ ,  $X_2^-$  compound, i varying from 1 to n, n varying from 2 to  
1024,  $F_2^i$  representing one of the functions,

mixing the n-fractions in order to produce a solution in the  $A_1^+X_1^-$  ionic liquid containing the n  $Y^+-L-F_2^i$ ,  $X_2^-$  products, i varying from 1 to n, annotated by  $\sum_{i=1}^{i=n} Y^+-L-F_2^i, X_2^-$  ;  
cleaving the solution annotated by  $\sum_{i=1}^{i=n} Y^+-L-F_2^i, X_2^-$  by transesterification or transamidation, in order to obtain in solution in the  $A_1^+X_1^-$  ionic liquid, a mixture of n  $G_i$  molecules, i varying from 1 to n, and the starting  $Y^+-L-F_0$ ,  $X_2^-$  functionalized salt;

separating the n  $G_i$  molecules from the  $A_1^+X_1^-$  ionic liquid and from the starting  $Y^+-L-F_0$ ,  $X_2^-$  functionalized salt in order to obtain a library containing n  $G_i$  molecules, said separating is a method selected from the group consisting of vacuum distillation, solvent extraction with heptane or toluene followed by evaporation of the solvent, chromatography on a column, chromatography on a plates and chromatography under pressure; and

repeating each mixing, cleaving and separating step j times, j being comprised between 2 and 10, in order to obtain j different libraries of n products,

wherein said mixing, cleaving and separating reactions are represented by



98. (new) A stable composition comprising:

an ionic liquid matrix of formula  $A_1^+X_1^-$  with non-functional ions; and

a functionalized salt of formula  $A_2^+X_2^-$  with at least one functional ion that is dissolved in the ionic liquid matrix so that the composition forms a homogeneous phase, wherein,

$A_1^+$  and  $A_2^+$  are substituted or non-substituted onium cations selected from the group consisting of pyridinium, imidazolium, ammonium, phosphonium or sulphonium cations, and

$X_1^-$  and  $X_2^-$  anions are selected from the group

consisting of  $\text{BF}_4^-$ ,  $\text{PF}_6^-$ ,  $\text{CF}_3\text{SO}_3^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{CF}_3\text{CO}_2^-$ ,  $\text{N}(\text{SO}_2\text{CF}_3)_2^-$ , halides,  $\text{BR}_4^-$ ,  $\text{RCO}_2^-$  and  $\text{RSO}_3^-$  with R selected from the group consisting of an alkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a perfluorinated or partially fluorinated group,  $\text{R}'\text{SO}_4^-$  with  $\text{R}'$  being selected from the group consisting of a hydrogen atom, a methyl group or an ethyl group, and complex anions resulting from the combination of a Lewis acid and a halide of general formula  $\text{MX}_j$  with j being an integer between 1 and 7, X being a halide and M representing a metal selected from the group consisting of aluminum, tin, zinc, bismuth, manganese, iron, copper, molybdenum, antimony, gallium or indium,

said at least one functional ion is one of a functional cation of a formula is  $\text{Y}^+-\text{L}-\text{F}_i$  and a functional anion of a formula  $\text{Y}^--(\text{L})_k-\text{F}_i$ ,

$\text{Y}^+$  and  $\text{Y}^-$  are ionic entities that carry the charge of the cation and the charge of the anion, respectively,

L is an alkyl group of 1 to 20 carbon atoms,

$\text{F}_i$  is a function varying from  $\text{F}_0$  to  $\text{F}_n$ , and selected from the group consisting of hydroxyl, carboxylic, amide, sulphone, primary amine, secondary amine, aldehyde, ketone, ethenyl, ethynyl, dienyl, ether, epoxide, primary phosphine, secondary phosphine, tertiary phosphine, azide, imine, ketene, cumulene, heterocumulene, thiol, thioether, sulphoxide,

phosphorus-containing moieties, heterocycles, sulphonic acid, silane, stannane and functional aryl functions,

$F_0$  being a function initially linked to said ionic entities,

$n$  being an integer varying from 1 to 10 representing a number of reactions,

$F_1$  to  $F_{10}$  being functions converted from said  $F_0$  after sequential reactions with said ionic entities,

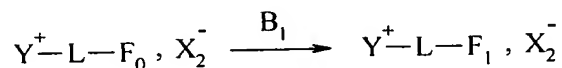
$k$  is equal to 0 or 1 so that when  $k$  is equal to 0,  $Y^-F_i$  is selected from the group consisting of  $OH^-$ ,  $F^-$ ,  $CN^-$ ,  $RO^-$  and  $RS^-$ , and

$R$  is an alkyl group of 1 to 20 carbon atoms or an aryl group of 6 to 30 carbon atoms.

99. (new) A method for the preparing a molecule from the stable composition of claim 98, comprising the steps of:

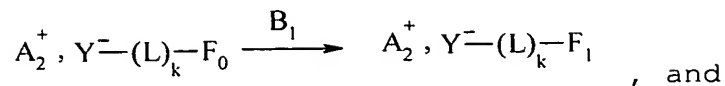
adding  $B_i$  reagents in  $n-1$  successive steps,  $1 < i \leq n$ ,  $n$  varying from 2 to 10, to the stable composition to obtain successive functions  $F_1$  until  $F_n$  on the ionic entity, wherein,

reagent  $B_1$  reacts with function  $F_0$  to produce a function  $F_1$  containing composition,  $F_1$  being linked at least one of the  $Y^+$ - ionic entity with the reaction being

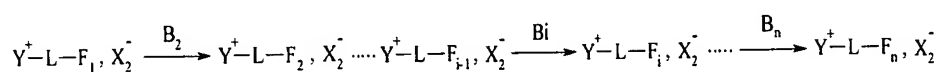




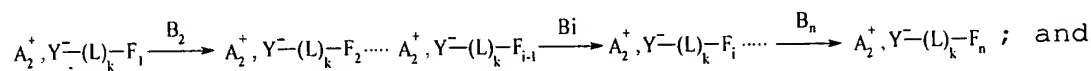
and the  $Y^-$  ionic entity with the reaction being



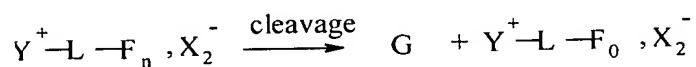
each reagent  $B_i$  reacts with a function  $F_{i-1}$ , leading to the obtaining of a function  $F_i$ , the  $(n-1)^{th}$  addition of the reagent  $B_n$  to the function  $F_{n-1}$  leading to the obtaining of the function  $F_n$ , the  $n-1$  successive reactions steps according to at least one of



and



cleaving the function  $F_n$  and producing a molecule  $G$  so that the  $A_2^+X_2^-$  functionalized salt is recovered in the form of at least one of  $Y^+ - L - F_0, X_2^-$  and  $A_2^+, Y^-(L)_k - F_0$  in solution in the  $A_1^+X_1^-$  ionic liquid matrix in at least one of



and

